concentrations in groundwater samples collected in this area of the B-aquifer were generally below state and federal TDS criteria. Figure 2-12 presents the maximum TDS values detected in the B-aquifer monitoring wells. Based on the TDS data alone, the B-aquifer at Parcel D would be considered suitable as a potential source of drinking water. The evaluation of other site-specific factors in this area indicated that the B-aquifer has low potential for use as a source of drinking water. These other site-specific factors include (1) the limited volume and storage capacity of the confined B-aquifer, (2) the existence of institutional controls that prohibit installing water supply wells within City and County of San Francisco limits and locating wells within 50 feet of a sanitary sewer or storm drain (see Figure 2-12), and (3) the current and historical uses of the B-aquifer (which has never been used for water supply at HPS). Therefore, the B-aquifer is considered to have a low potential for use as a source of drinking water. However, because of agreements made with the BCT on the HHRA, the groundwater ingestion pathway is included in the risk assessment for the B-aquifer. This assumption provides an additional layer of conservatism for the protection of human health at HPS.

2.3 PARCEL D INVESTIGATION HISTORY

Parcel D has been investigated following the CERCLA process. Parcel D underwent a sequence of initial investigations from 1988 to 1996. Investigations began with a preliminary assessment, which involved record searches, interviews, and limited field investigations. Sites that required further investigation were considered during the site inspection phase, which involved collection and evaluation of additional field data. Finally, sites that required even further investigation were considered during the RI phase. The RI was followed by a FS, proposed plan, ROD, risk management review (RMR), and revised FS. The following subsections summarize the significant aspects of the RI, FS, proposed plan, ROD, RMR, and revised FS.

Table 2-4 briefly describes each IR site at Parcel D and summarizes past cleanup actions and recommendations presented in past reports for Parcel D. Detailed descriptions and findings can be found in the original documents. In the various investigations and reports, areas requiring remediation were given unique alpha-numeric identifiers. Large areas were called remediation areas and their identifiers started with "RA." Small areas were called "*de minimis*" areas and their identifiers started with "DM." In order to present information consistent with previous reports, Table 2-4 includes these alpha-numeric identifiers.

2.3.1 Remedial Investigation

A draft final Parcel D RI was completed on October 25, 1996, and addressed the original 27 IR sites in Parcel D (PRC, LFR, and U&A 1996). The RI became final on January 31, 1997, following submission of responses to agencies' comments on the draft final version (Tetra Tech 1997b). The two most significant aspects of the RI report are (1) the site characterization of contaminants and (2) the HHRA. No ecological risk assessment was conducted because there is no ecological habitat of concern at Parcel D because most of the parcel is an industrial setting covered by buildings or pavement.

The HPS IR sites were characterized using biased sampling in areas where chemicals were known to have been used, stains were observed, or the potential for spills existed. These IR sites were delineated as buildings or areas that had been used for various industrial processes. The site chemical characterization presented in the RI compared chemical compounds in the soil and groundwater with a variety of regulatory screening criteria concentrations. Those chemicals that exceeded screening criteria were posted on a series of IR site maps. The maps illustrated the location of chemicals with respect to potential sources, and recognizable spatial patterns. The RI documented the site characterization activities.

The HHRA conducted for Parcel D during the RI was similar to that conducted in the other parcels at HPS and was designed by the HPS BCT. All of the parcels were evaluated for three human health risk scenarios: (1) the current land use, which was industrial; (2) a future industrial land use; and (3) a future residential land use. The question of the appropriate exposure area for a site industrial worker or resident was discussed by the BCT prior to completing the HHRA, and the BCT decided to use a grid system for conducting the parcel-wide risk assessment. The final grid size agreed to by the BCT was 0.5 acre for an industrial scenario. In addition, it was assumed that construction and maintenance activities could bring soil from a depth of 10 feet to the surface and, therefore, contamination from 0 to 10 feet below ground surface (bgs) should be considered in the HHRA. As a result, the human health risk was calculated for all of the samples between 0 and 10 feet bgs within the 0.5-acre grid cell, and the total cumulative risk for that cell was reported in the HHRA.

No risk management evaluations were included as part of the RI. Instead, the BCT decided that all of the 27 IR sites described in the RI would be assessed during the FS evaluation since all 27 IR sites contained exposure areas (HHRA grid cells) that exceeded at least one of the screening criteria; that is, an excess lifetime cancer risk (ELCR) greater than 10^{-6} for a future industrial worker or resident, a segregated HI greater than 1, or lead concentrations exceeding 1,000 milligrams per kilogram (mg/kg).

2.3.2 Feasibility Study

The draft final Parcel D FS was submitted on January 24, 1997 (Tetra Tech 1997a), and became final on August 29, 1997, following an extended period of written comments and responses (Tetra Tech 1997d). The FS used the results and analyses in the RI report to identify, screen, and evaluate remedial alternatives for Parcel D and to define areas for proposed remedial action. Three different cleanup scenarios and associated cleanup goals were considered in the FS. Scenario 1 consisted of cleanup to the industrial land use scenario with a 10^{-5} ELCR; Scenario 2 consisted of cleanup to the industrial land use scenario with a 10^{-6} ELCR; and Scenario 3 consisted of cleanup to the residential land use scenario with a 10^{-6} ELCR. For each of these scenarios, the costs of cleanup and the areas that exceeded the cleanup goals were defined for each of the remedial alternatives proposed. Each scenario also considered cleanup of soils representing an HI greater than 1 and lead concentrations greater than 1,000 mg/kg.

The FS used the RI data to delineate those areas that exceeded the different cleanup goals for each reuse scenario and cleanup level. The HHRA results were used to identify chemicals that were risk drivers, and the RI characterization data were used to define the extent of the cleanup areas. The lateral extent of the soil cleanup areas in each IR site was determined by either (1) defining the interpreted lateral extent of chemicals considered risk drivers for the area, or (2) assuming an 8-foot-wide by 8-feet-long area for locations having a single boring with chemicals exceeding risk-based concentrations (RBC). The 8-foot by 8-foot area was proposed based on the assumed smallest possible sized excavation that would not requiring sidewall shoring. The vertical extent of each area was determined to be 2 feet below the deepest sampling location that contained a chemical exceeding the screening criteria, the depth to the shallowest water table, or 10 feet bgs, whichever was shallowest. The industrial land use scenario and cleanup goals resulted in 20 IR sites containing soil cleanup areas, while the residential scenario and cleanup goals resulted in 23 IR sites containing soil cleanup areas. No risk management evaluations were conducted as part of the FS, and all soil cleanup areas that exceeded at least one of the various cleanup criteria under each reuse scenario were identified in the final FS.

2.3.3 Proposed Plan and Record of Decision

The proposed plan for Parcel D was published on May 11, 1997 (Tetra Tech 1997c), and a public meeting was held on May 21, 1997. The Navy's preferred remedy was to excavate the contaminated soils, dispose of the soils off site, and backfill with clean soil. The cleanup goal chosen corresponded to a cumulative 10^{-5} ELCR and an HI of 1 based on an industrial reuse scenario and lead concentrations in soil of 1,000 mg/kg. One of the 20 IR sites was not included in the proposed plan because the parcel boundary was changed so that IR-36 was excluded from Parcel D and included in Parcel E. As a result, the proposed plan included 19 IR sites for soil remediation.

The comments received during the public comment period did not change the proposed remedy or the areas proposed for remedial action. The comments did raise the issue of the recommended 10^{-5} ELCR cleanup goal, with a cleanup goal of 10^{-6} ELCR being preferred by some responders. The Navy determined that the original recommended cleanup goal of 10^{-5} ELCR was the most appropriate approach, and it was included in the ROD.

The draft Parcel D ROD was submitted to the regulatory agencies on November 3, 1997 (Tetra Tech 1997e). As presented in the draft ROD, the selected remedy was excavation and off-site disposal of soils based on the cleanup goals described in the proposed plan. Subsequent to the submittal of the draft ROD, the costs and environmental improvements associated with the selected soil remedy for Parcel D were reviewed by the Navy. Navy concerns regarding the level of risk reduction, cost effectiveness of the cleanup approach, and discussions with other members of the BCT resulted in the RMR.

2.3.4 Risk Management Review Process

The RMR process was developed and conducted during a series of meetings held by the Navy and the regulatory agencies from January through April 1999. The process employed various

criteria and decision rules to reevaluate whether remedial actions were required at 19 of the 27 IR sites in Parcel D that were originally determined to require remedial actions for soil. The primary decision questions were:

- Is the site adequately characterized?
- Has a change in regulatory screening criteria eliminated risk drivers at the site?
- Are risk drivers associated with ambient conditions in fill or asphalt surface cover?
- Have removal actions or other actions reduced risk to an acceptable level?
- Are there other mitigating factors that reduce risk to an acceptable level?

The RMR consisted of a comprehensive evaluation of each IR site. The data for the entire site, including the nature and extent of soil contamination and specific chemicals driving the risk to human health were reviewed and evaluated during the 10 RMR meetings. All soil contamination identified between 0 and 10 feet bgs was considered in the RMR process. During the review, the nature and extent of soil contamination was re-evaluated, including assessment of the major risk "drivers" defined as the chemicals that contribute over 90 percent of the total risk, and mitigating factors associated with the type and location of chemicals detected in soil samples. The adequacy of the site characterization was considered a significant evaluation factor by the risk management review team and was one of the first aspects reviewed. The reasonably anticipated future use of the Parcel D sites, as specified in the July 1997 Redevelopment Plan, was also considered during the RMR process (San Francisco Redevelopment Agency 1997).

Regulatory screening criteria had changed since the HHRA was conducted for the RI. During the RMR process, the 1998 EPA preliminary remediation goals (PRG) were used to evaluate site risks. The 1998 PRGs differed from the 1995 PRGs used in the RI. The 1998 PRGs incorporated revised input parameters. Since 1995, EPA had developed new guidance for risk assessment input parameters for several classes of chemicals, which was used during the RMR process. The revised 1998 EPA guidance included (1) recommending evaluating beryllium only under the inhalation route for cancer effects and eliminating the oral slope factor; (2) updated oral and inhalation slope factors for the polychlorinated biphenyls (PCB) Aroclor-1254 and Aroclor-1260; (3) new reference doses for approximately 20 noncancer chemicals; (4) updated soil-to-skin adherence assumptions for adult and child receptors; and (5) updated skin surface area values for adult and child receptors (EPA 1998d).

During the Parcel D RMR process, the significance of arsenic detections was balanced according to several factors: (1) the 1998 residential Region 9 PRG, which was 0.38 part per million (ppm) for a 1 in a million excess cancer risk and 21 ppm for noncancer endpoints, and (2) the HPAL for arsenic at 11 ppm, which is the 95th percentile of the unimpacted soil concentrations detected at HPS. The BCT agreed to use "twice the HPAL" or 22 ppm as the site-specific arsenic goal, which is consistent with EPA's general goal to manage risks to within the risk range (1×10^{-4} to 1×10^{-6}) and below an HI of 1. However, spatial distributions, both vertically and horizontally,

operational histories of the site, sampling density, soil horizons, volume of soil impacted, and concentrations were also considered to evaluate the need for CERCLA response action. It should be noted that the 1999 industrial PRG for arsenic's noncancer endpoints was 22 ppm.

The Navy agreed that EPA's guidance for remedial actions at Superfund sites with PCB contamination was appropriate guidance to be considered for the RMR process (EPA 1990b). This guidance states that action levels in the range of 10 to 25 mg/kg should be established for PCB cleanups in soil at industrial sites, with a limit of 1 mg/kg for residential use. After considering site-specific conditions at HPS that may affect exposure, the Navy selected the conservative end of the industrial range provided in the EPA guidance (EPA 1990b). Therefore, under the RMR process, a total PCB action level of 10 mg/kg was considered by the Navy as protective of human health and the environment for industrial reuse areas, such as Parcel D. As noted in the EPA guidance, a PCB concentration of 10 mg/kg equates to an estimated ELCR of 1×10^{-5}, under an industrial reuse scenario. Although the Navy and EPA agreed it was appropriate to consider this guidance during the Parcel D RMR process, DTSC disagreed with this approach and preferred to use the 1998 industrial PRG of 1.3 mg/kg, which equates to an ELCR of 1×10^{-6}.

At the conclusion of the RMR process, the review team confirmed or eliminated sites from proposed remedial action based on current risk. After completion of the review, all sites fell into one of the following three categories: (1) sites that the team agreed no response action was required, (2) sites that the team agreed response action was required, and (3) sites that the team did not yet agree on the course of action. The results of the RMR process are documented in the draft final Parcel D RMR process report (Tetra Tech 2000a). Table 2-4 briefly summarizes the Navy's RMR recommendations and Appendix J, Attachment J-2, includes additional RMR summary tables from the Parcel D RMR process report.

The Navy conducted a TCRA for soil sites based on the results of the RMR process, which are later described in Section 2.4 of this report. The TCRA cleanup goals are listed in the "Final Sampling and Analysis Plan Parcel D Soil Site Delineation" (Tetra Tech 2000b).

2.3.5 Draft Revised Feasibility Study

The Navy submitted the draft Parcel D revised FS report on March 8, 2002. The revised FS combined existing RI data with new data collected after completion of the RI. The data were summarized and evaluated in the revised FS report to refine the site conceptual model, further define the nature and extent of contamination, assess potential risks based on existing site conditions, and develop and evaluate revised alternatives. The data evaluation included (1) a comparison of new and existing data to updated screening criteria, (2) a revised evaluation of groundwater beneficial uses and exposure pathways, and (3) a revised assessment of potential risk posed through exposure to soil and groundwater at Parcel D. Following data evaluation, RAOs were developed. These RAOs were stated in terms of a risk range rather than specific concentrations for contaminants. These RAOs were determined to be insufficient to support the conveyance agreement subsequently signed with the City and County of San Francisco (Navy and San Francisco Redevelopment Agency 2004). Remedial alternatives developed in the draft Parcel D revised FS report included no action and institutional controls.

- **IR-08**: Approximately 13 cubic yards of soil containing PCBs was excavated from RA-4. The cleanup goal for PCBs was 1 mg/kg.

- **IR-09**: Soil in DMs 6864, 6965, 6967, and 7167 was further characterized for chromium VI. This investigation provided additional characterization of soil after the Pickling and Plate Yard removal action. Concentrations of chromium VI in these areas were less than the TCRA cleanup goal of 10 mg/kg in this area

- **IR-37:** Approximately 25 cubic yards of soil containing PCBs was excavated from RA 37-1; the cleanup goal for PCBs was 1 mg/kg. Approximately 44 cubic yards of soil containing antimony was excavated from RA 37-2. The cleanup goal for antimony was 19 mg/kg in this area.

- **IR-53:** Approximately 6 cubic yards of soil containing PAHs was excavated from DM 11260. The cleanup goal for benzo(a)pyrene was 0.33 mg/kg.

- **IR-55:** Approximately 7 cubic yards of soil containing lead was excavated from DM 10676. The cleanup goal for arsenic was 11 mg/kg throughout Parcel D.

- **IR-65:** Approximately 12 cubic yards of soil containing arsenic was excavated from DM 8866. The cleanup goal for arsenic was 11 mg/kg.

Excavated soil was disposed of at an off-site landfill. At each site, confirmation samples were collected and analyzed to ensure that the TCRA cleanup goals were met. Subsequently, the excavations were backfilled and the sites were regraded.

Steam and fuel lines were also addressed during the TCRA. The steam lines were constructed in the 1950s and operated until 1984. The steam pipes are covered in asbestos pipe lagging insulation in most areas. The Navy leased portions of HPS to Triple A from 1976 to 1986; it was alleged that Triple A used sections of the abandoned steam lines to transfer waste oil. Steam lines that were saturated with oil were removed under the TCRA. Most steam lines on Parcel D were left in place after the asbestos abatement. Areas where the asbestos was damaged were inspected for liquids, oily waste, or staining. Steam lines were pressure tested with compressed air when wipe samples exceeded project requirements or when visible waste oil was in the pipe. Samples of liquids or wipe samples from the inside of the pipe were collected. Asbestos was not removed on pipes that remained in place. The inside surface of the pipes were cleaned out with a vacuum truck followed by pressure washing where residual fluids remained. In addition, soil samples were collected where releases were suspected. In a few instances, soil sample results exceeded the TCRA goals, resulting in further excavation until bottom samples met the goals of the TCRA (Tetra Tech 2001b). In addition, a 150-foot segment of fuel line was removed from Parcel D during the TCRA. Waste materials were disposed of in appropriate off-site permitted facilities. All field activities conducted and analytical data collected during the TCRA are documented in the closeout report (Tetra Tech 2001b).

2.4.8 Parcel D Radiological Time-Critical Removal Action

A radiological TCRA is ongoing at several locations at Parcel D. These actions are discussed in the historical radiological assessment of HPS, completed in August 2004 (RASO 2004). The radiological TCRA began at Building 364 and the surrounding area in February 2001 to remove contamination from the former site of a cesium-137 spill. Soil and a waste tank pit were removed. Further investigation, remediation, and surveying were conducted in 2002 (RASO 2004).

The historical radiological assessment identified the following Parcel D sites as radiologically impacted: Building 274, Building 313 site, Building 313A site, Building 317 site, Building 322 site, Building 351, Building 351A, Building 364, Building 365, Building 366, Building 383 Area, Building 408, Building 411, the former NRDL site on Mahan Street, the Gun Mole Pier, Building 813, and Building 819 (RASO 2004). The historical radiological assessment summarizes the assessments, investigations, and surveys completed and the recommendations for the impacted sites at Parcel D (RASO 2004). Recommended actions are ongoing under the facility-wide radiological TCRA. The action memorandum for the facility-wide TCRA specifies that radiological contamination will be addressed by removal and off-site disposal (Navy 2001). Documentation of completed activities is under preparation.

2.4.9 Parcel D Soil Stockpile Removal Action

In July and August 2003, the Navy inventoried all the stockpiles at HPS and identified 37 piles located within the current Parcel D boundary (Tetra Tech and ITSI 2005). Two other stockpiles (SPD37 and SPD41) were formerly located within Parcel D but are now located within the boundary of Parcel E, based on the 2005 revised boundary between the two parcels. Each stockpile was surveyed to document the location, estimate the volume, and establish photo documentation of each pile. Each stockpile was also assigned a unique identification number. All 37 stockpiles located at Parcel D are shown on Figure 2-14.

In February 2004, nine stockpiles were removed from Parcel D (SPD23 through SPD31) as part of a TCRA. All of the stockpiles consisted primarily of soil, except for the three stockpiles in or near IR-17 (SPD28, SPD29, and SPD30), which consisted mostly of asphalt. Soil samples were collected from the stockpiles to characterize the material for appropriate off-site disposal, and confirmation samples were collected from beneath the stockpiles that were located on native soil to assess if the removal action was complete (Tetra Tech and ITSI 2005). Table 2-5 lists the 28 Parcel D stockpiles for future removal, and Figure 2-14 shows the location of these piles. Based on the 2003 investigation, these stockpiles contain approximately 560 cubic yards of material for disposal, including an estimated 540 cubic yards of soil and 20 cubic yards of asphalt and other material.

As part of the same TCRA used for the soil stockpile removal, the Navy also excavated a buried fuel line site that was given the unique identifier DM BK32. This DM area designation was not part of the RMR process, and this DM designation does not appear as part of the IR evaluation in Table 2-4. The removal at DM BK32 consisted of clearing the surface area, excavating soils,

surveying the excavation area, collecting confirmation samples, disposing of excavated soil off site, and backfilling the excavation (Tetra Tech and ITSI 2005).

An additional area (DM 9363) was proposed in the TCRA for removal. This site is located inside Building 306 in IR-35. The building formerly housed a transformer that leaked PCBs and containers that reportedly contained PCBs. However, the evidence was only visual (staining in the underlying concrete and gravel). Since no removal was undertaken at the site, an additional investigation of this area is recommended.

2.4.10 Parcel D Waste Consolidation Cleanup Action

The purpose of the waste consolidation cleanup action was to identify and address potential environmental issues associated with the industrial use of buildings in Parcel D that could impact the planned transfer of the property to the City and County of San Francisco of San Francisco. From April to July 2002, surveys were conducted in and around 69 buildings in Parcel D to identify industrial process equipment, materials, structures, and other miscellaneous items that could pose a health risk and to locate and identify Resource Conservation and Recovery Act (RCRA), non-RCRA, or universal wastes. From May 2002 to April 2003, samples were collected and analyzed from various industrial process equipment and waste consolidation items to identify those requiring action (decontamination, labeling, or removal) to support the Parcel D property transfer. From April 2002 to June 2003, decontamination and waste consolidation and disposal activities were conducted. Decontamination and waste consolidation and disposal activities are summarized below.

- Encapsulating or removing asbestos-containing material
- Removing and disposing of structural materials, paint booths, and numerous abandoned waste items
- Removing and disposing of hoods, vents, and ducts associated with industrial processes
- Removing or disabling existing aboveground storage tanks
- Cleaning industrial process-related sumps, vaults, trenches, and equipment foundations

At the conclusion of the decontamination and waste consolidation activities, unoccupied buildings in Parcel D were secured to limit unauthorized access and to aid in maintaining the buildings in a condition suitable for transfer (Foster Wheeler Environmental Corporation 2003).

2.4.11 Total Petroleum Hydrocarbon-Contaminated Soil Excavation

In 2004, one location, CAA-4, at Parcel D was excavated to remove TPH-contaminated soil (see Figure 2-13). The removal was conducted under the HPS TPH Corrective Action Program, which addresses areas of TPH contamination. The goal of the excavation activities was to remove soil that contained TPH at concentrations exceeding the cleanup level of 3,500 mg/kg. The excavation footprint was delineated based on a screening evaluation of existing analytical data. After excavation, confirmation samples were collected and analyzed for TPH and TPH-related chemicals of concern (TPA-CKY 2005).

2.4.12 Storm Drain and Sanitary Sewer Removal Action

In 2007, the Navy began investigating the storm drains and sanitary sewer lines for potential radiological contamination. These lines will be removed and disposed of because the investigation requires removing these utilities to begin the radiological testing. This action is currently ongoing under the "Revised Basewide Storm Drain and Sanitary Sewer Removal Action Work Plan" and is expected to be completed in 2008 (Tetra Tech EC 2007).

2.5 Extent of Contaminated Soil and Groundwater

This section presents an overview of the current extent of contamination present in Parcel D soil and groundwater based on data collected through June 2004. The COCs identified based on the results of the HHRA and environmental evaluation summarized in Section 3.0 were used to focus the discussion of soil and groundwater contamination presented in this section. In accordance with the HHRA in Section 3.0 and Appendix B, COCs are those analytes that drive risk in ECLR risk greater than 1×10^{-6} or an HI greater than 1. In addition, COCs in groundwater were identified that present a potential threat to the Bay based on the evaluation of groundwater data as compared to surface water screening criteria (see Section 3.2). These COCs are also the focus of this FS report and will require remedial action by the Navy.

The nature and extent of contaminants in soil and groundwater at Parcel D were presented in greater detail in the previous RI and FS reports (PRC, LFR, and U&A 1996; PRC and LFR 1997). The nature of contaminants at Parcel D can mostly be attributed to industrial activities by the Navy or other tenants, except for several metals found at ambient concentrations.

The Navy maintains a comprehensive database of analytical results reported at HPS for both soil and groundwater. Because this section is meant to provide an overview of the extent of contaminants that pose the greatest risk at Parcel D, sample-specific data are not presented in the figures and tables of this section. Sample-specific information is presented in Appendix A. Appendix A includes figures showing sampling locations with sample identification labels and tables of sample analysis data for both Parcel D soil and groundwater. For soil sample data, soil sampling locations that were removed as part of an interim action have been excluded from these tables. Confirmation sample data collected during these removal actions are included in the data set. The groundwater sample data tables include all available analytical data through June 2004.

TABLE 2-1: PARCEL D HISTORICAL AND CURRENT USE OF BUILDINGS

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

Site	Building No.[a]	Area (ft^2)[b]	Former Shipyard Use (1940 to 1974)[c]	Post-Navy Use[d]	Radiological Contamination Potential[e]
IR-22	368	8,000	Navy service building used by the former tenant as a woodworking operation and a pipefitting shop	Woodworking	None
	369	8,810	Navy storage of public works equipment; rigging shop	Vacant	None
IR-32	370	1,209	Latrine, restrooms, and showers	Vacant	None
	383	10,200	Poseidon, shipping, and receiving. Vicinity was a turn-in area for radium devices before building was constructed.	Vacant	Unlikely
IR-33 North	302/303	44,775	Transportation shop for automotive and locomotive repairs	Storage	None
	304	1,070	Service station	Vacant	None
IR-33 South	364	2,255	Storage for the NRDL radiological research and chemistry operations	Laboratory for refining metals (Young Laboratory)	Known-Restricted Access to Room 107
	365	842	Storage, offices, and film developing laboratory	Vacant	Unlikely
	411	287,976	Ship-fitters shops and boiler maker shop	Workshop and storage	Unlikely
	417	500	Acetylene manifolds and welding engineers	Storage	None
	418	1,387	Quality and reliability assurance welding engineering facility, and metal spraying	Offices and workshop	None
	424	805	Area Time House No. 4/Oxygen cylinder charging facility	Storage	None
IR-34	351	38,204	Electronics shop, electronics and optical laboratory, sampling laboratory, biological research laboratories, machine shop, offices, storeroom.	Vacant	Likely

TABLE 2-1: PARCEL D HISTORICAL AND CURRENT USE OF BUILDINGS (CONTINUED)
Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

Site	Building No.[a]	Area (ft^2)[b]	Former Shipyard Use (1940 to 1974)[c]	Post-Navy Use[d]	Radiological Contamination Potential[e]
34	351A	22,879	NRDL offices, instrument repair, metrology laboratory, guard post.	Vacant	Likely
	366	36,313	Boat and plastic shop (former 351B). NRDL instrument calibration; chemical laboratory	Workshop	Known-Continued Access
IR-35	274	4,000	Midway Liaison Office	Vacant	Unlikely
	306	1,752	Electrical Substation I	Electrical Substation	None
	313	Demolished	NRDL Instrumentation laboratory, stockroom and storage	Demolished, vacant area (site of former buildings)	Likely
	313A	Demolished	Laboratory offices, training and storage	Demolished, vacant area (site of former buildings)	Likely
	372	2,875	Prefab decking shelter	Storage	None
	313(d) and 313A(d)	Demolished	NRDL Annex G	Demolished	None
IR-37	401	44,064	Public works shop	Art activities workshop and storage	None
	423	392	Compressor hut and paint storage	Vacant	None
	435	3,000	Equipment storage	Storage	None
	436	3,000	Painting and paint storage facility	Storage	None
	437	984	Pipe storage	Vacant	None
IR-44	408	1,836	Furnace/smelter	Vacant	Likely
	409	230	Welder motor generator	Vacant	None
	410	230	Welder motor generator	Vacant	None
	438	432	Metal spray shelter	Vacant	None

TABLE 2-1: PARCEL D HISTORICAL AND CURRENT USE OF BUILDINGS (CONTINUED)
Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

Site	Building No.[a]	Area (ft^2)[b]	Former Shipyard Use (1940 to 1974)[c]	Post-Navy Use[d]	Radiological Contamination Potential[e]
IR-53	525	4,000	Storehouse for containers of adhesive, joint sealing compounds, paint emulsions, and other materials	Vacant	None
	530	3,200	Public works shop used as an automotive hobby shop	Vacant	None
IR-55	307	10,000	Electronic assembly facility	Vacant	None
IR-65	324	6,000	Carbon dioxide refilling station	Vacant	None
IR-66	407	42,183	Ships operational activity parts and offices	Moving and storage	None
IR-67	439	100,000	Sheet metal shop/warehouse	Vacant	None
IR-68	374(d)	Demolished	Poseidon control and instrumentation hut	Demolished, vacant area (site of former buildings)	None
	375(d)	Demolished	Poseidon control hut	Demolished, vacant area (site of former buildings)	None
	376	480	Poseidon control hut	Vacant	None
	378	800	Latrine, restroom, and shower	Vacant	None
	379	1,280	Poseidon engineering	Office	None
	382	1,140	Poseidon arresting system shelter	Vacant	None
IR-69	523	574	Saltwater pump house	Vacant	None
IR-70	S-308	18,000	Storage	Storage	None
NA	305	Unknown	Unknown	Storage	None
NA	308/308A	1,463	Salt water pump house	Salt water pump house	None
NA	311	1,800	Latrine and ships office	Unknown	None
NA	317	Demolished	Temporary animal quarters for NRDL	Demolished, vacant area (site of former buildings)	Likely
NA	322	Demolished	NRDL office, NRDL Instruments Branch and Field Office	Demolished, vacant area (site of former buildings)	Likely

TABLE 2-1: PARCEL D HISTORICAL AND CURRENT USE OF BUILDINGS (CONTINUED)
Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

Site	Building No.[a]	Area (ft^2)[b]	Former Shipyard Use (1940 to 1974)[c]	Post-Navy Use[d]	Radiological Contamination Potential[e]
NA	323	4,000	Shore activities, electronics, and boat shop	Art activities	None
NA	363	21,471	Woodworking shop	Workshop (Quality Craftsman)	None
NA	373(d)	Unknown	Poseidon control hut No.1 and 5	Demolished, vacant area	None
NA	377	4,240	Poseidon systems test engineering	Vacant	None
NA	380	2,084	Poseidon test machine	Vacant	None
NA	381	4,000	West coast shock testing facility	Vacant	None
NA	384	4,664	Poseidon engineering	Fire department equipment and storage	None
NA	385	3,672	Poseidon	Storage	None
NA	402	36,314	Supply storehouse, and Q and RA offices	Moving and storage	None
NA	404	50,859	Supply storehouse	Workshop/manufacturing sheet metal products	None
NA	412	82	Railroad scales	Railroad scales	None
NA	419	682	Oxygen converter	Storage, Public Works Center	None
NA	710	88	Latrine	Vacant	None
NA	813	68,644	General warehouse and offices, supply storehouse	Vacant	Unlikely
NA	819	120	Sewer pump station A	Sewer pump station	Likely
NA	Former NRDL Site	2,400	Unknown, potential storage site of radiological material	Open area	Likely
NA	Gun Mole Pier		Decontamination and laboratory facility	Unused	Likely

TABLE 2-1: PARCEL D HISTORICAL AND CURRENT USE OF BUILDINGS (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

Notes:

a	List of buildings is based on the basewide environmental baseline survey for Hunters Point Shipyard (Tetra Tech 1998).
b	Area from the basewide environmental baseline survey for Hunters Point Shipyard (Tetra Tech 1998).
c	HPS was deactivated as a Navy facility in 1974.
d	Post-Navy use reflects usage in the basewide environmental baseline survey for Hunters Point Shipyard (Tetra Tech 1998).
e	Radiologically affected areas and the contamination potential are presented in the Historical Radiological Assessment (Navy 2004b). A radiologically impacted area is defined as: An area that has or historically had a potential for general radioactive materials contamination based on the site operating history or known contamination detected during previous radiation surveys. Impacted sites include sites where radioactive materials were used or stored; sites where known spills, discharges, or other instances involving radioactive materials have occurred; or sites where radioactive materials might have been disposed of or buried.
ft^2	Square feet
IR	Installation Restoration
NA	Building not located within IR site boundary
Navy	U.S. Department of the Navy
NRDL	Naval Radiological Defense Laboratory
Tetra Tech	Tetra Tech EM Inc.

References:

Navy. 2004b. "Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939-2003, Hunters Point Shipyard, San Francisco, California." August 31.

Tetra Tech. 1998. "Hunters Point Shipyard Basewide Environmental Baseline Survey." September 4.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-08	RA 8-4	**FS:** Two areas at IR-08 (RA 8-1 and RA8-2) were identified for further action based on arsenic, benzo(a)pyrene, and Aroclor-1260. RA 8-4 (boring IR08B018A) was not specifically identified. IR-08 was identified as requiring action based on a the spill of PCB-containing waste oil onto soil during construction of Building 606 in 1988. IR-08 is now part of Parcel E, although RA 8-4 is in Parcel D. The Navy conducted an interim removal action at IR-08 in an area that is now part of Parcel E. About 1,255 cubic yards of soil was excavated to depths ranging from 3 to 10 feet bgs from an area measuring 50 by 150 feet (Barajas 2007). **RMR**: Based on site-specific conditions and the RMR criteria, no remedial action recommended at IR-08B018A. **TCRA SAP:** The Navy proposed additional investigation based on the detection Aroclor-1260 in one sample from location IR08B018A. **TCRA CR 1:** Excavated 13 cubic yards of soil; maximum depth 3 feet bgs.
IR-09	RA 9-1	**FS:** RA 9-1 (borings IR09B001 through IR09B009 and IR09PPY1) identified as requiring action for arsenic, beryllium, lead, nickel, PAHs, and PCBs. **RMR**: Based on site-specific conditions and the RMR criteria, no remedial action recommended for arsenic, beryllium, lead, nickel, PAHs, and PCBs; however, agencies requested further investigation for hexavalent chromium at four soil borings (IR09B003, IR09B006, IR09B007, and IR09B011) in which total chromium concentrations exceeded the sample-specific HPAL. **TCRA SAP:** The four soil borings identified in the RMR as requiring further investigation were designated as new *de minimis* areas: DM 6864 (IR09B003), DM 6965 (IR09B006), DM 6967 (IR09B007), and DM 7167 (IR09B011). Delineation sampling concluded that no remedial action was required for hexavalent chromium. **TCRA CR 1:** Analysis of TCRA samples did not detect hexavalent chromium or total chromium at concentrations above the TCRA industrial cleanup goals. No excavation performed.
	RA 9-2	**FS:** RA 9-2 (borings IR09B016 and IR09B017) identified as requiring action for arsenic and PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action required for arsenic and PAHs.
	RA 9-3	**FS:** RA 9-3 (borings IR09B019, IR09B020, IR09B022, IR09B023, IR09B023A, IR09B024, IR09MW35A, IR09P35AA, and IR09P35AB) identified as requiring action for metals. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action required for metals.
	DM 6864	**FS:** Identified as part of RA 9-1 (above). **RMR:** Redesignated as the areas surrounding boring IR09B003 requiring further investigation for hexavalent chromium. **TCRA SAP:** Delineation sampling concluded that no remedial action was required for hexavalent chromium. **TCRA CR 1:** Analysis of TCRA samples did not detect hexavalent chromium or total chromium at concentrations above TCRA industrial cleanup goals. No excavation performed.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
	DM 6965	**FS:** Identified as part of RA 9-1 (above). **RMR:** Redesignated as the areas surrounding boring IR09B006 requiring further investigation for hexavalent chromium. **TCRA SAP:** Delineation sampling concluded that no remedial action was required for hexavalent chromium. **TCRA CR 1:** Analysis of TCRA samples did not detect hexavalent chromium or total chromium at concentrations above TCRA industrial cleanup goals. No excavation performed.
	DM 6967	**FS:** Identified as part of RA 9-1 (above). **RMR:** Redesignated as the areas surrounding boring IR09B007 requiring further investigation for hexavalent chromium. **TCRA SAP:** Delineation sampling concluded that no remedial action was required for hexavalent chromium. **TCRA CR 1:** Analysis of TCRA samples did not detect hexavalent chromium or total chromium at concentrations above TCRA industrial cleanup goals. No excavation performed.
IR-09 (cont.)	DM 7167	**FS:** Identified as part of RA 9-1 (above). **RMR:** Redesignated as the areas surrounding boring IR09B011 requiring further investigation for hexavalent chromium. **TCRA SAP:** Delineation sampling concluded that no remedial action was required for hexavalent chromium. **TCRA CR 1:** Analysis of TCRA samples did not detect hexavalent chromium or total chromium at concentrations above TCRA industrial cleanup goals. No excavation performed.
IR-16	NA	**FS:** Identified arsenic, lead, and PCBs as requiring remediation. **EE Removal Action:** EE-15/16, an irregular-shaped area approximately 990 square feet, was excavated to a depth of 2 feet bgs. **RMR:** Based on previous removal actions (EE-15/16), site-specific conditions, and the RMR criteria, no further remedial action recommended for arsenic, lead, and PCBs.
IR-17	NA	**FS:** Identified arsenic, lead, and PCBs as requiring remediation. **TCRA CR 2:** Nine stockpiles (SPD-23 through SPD-31) within and in close proximity to IR-17 were removed as part of the TCRA conducted in 2004. The stockpiles were over-excavated by 0.5 foot bgs because they were located on unpaved soil, and confirmation samples were collected at the bottom of the excavation footprints. Analytical results for benzo(a)pyrene from the confirmation samples collected at SPD-23 and SPD-31 exceeded the TCRA screening criterion. In addition, a fuel line area identified in TCRA CR 1 south of IR-17(DM BK32) was excavated as part of TCRA CR 2 to remove PAH and petroleum contamination in soil. This excavation was 35 feet wide by 110 feet long by 10 feet deep, and approximately 1,759 cubic yards of soil was removed. All analytical results for sidewall and bottom confirmation samples collected from this excavation were below TCRA screening criteria.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-22	DM 9654	**FS:** DM 9654 (test pit PA45TA09) identified as requiring remedial action for PAHs. **Parcel D RMR:** Due to parcel boundary changes, DM 9654 is now in site IR-57 of Parcel C. **Parcel C RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
	DM 9562	**FS:** DM 9562 (boring IR22B014) identified as requiring action for beryllium. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for beryllium.
	DM 9752	**FS:** DM 9752 (boring IR22B003) identified as requiring action for arsenic. **Parcel D RMR:** Due to parcel boundary changes, DM 9752 is now in IR-57 of Parcel C.
	DM 9759	**FS:** DM 9759 (boring IR22B012) identified as requiring action for PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
	DM 10956	**FS:** DM 10956 (boring IR51B032) identified as requiring action for PCBs and PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PCBs or PAHs.
IR-32	DM 11367	**FS:** DM 11367 (boring PA32B003) identified as requiring action for PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
IR-33	RA 33N-1	**FS:** RA 33N-1 (borings IR33B069, IR33B070, IR33B091, and IR33MW61A) identified as requiring action for PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
	DM 7353	**FS:** DM 7353 (boring IR33B105) identified as requiring action for hexavalent chromium. **EE Removal Action:** EE-12, a triangular area approximately 34 by 25 by 28 feet, was excavated to a depth of 10 feet bgs. Approximately 160 cubic yards was disposed of off site. **RMR:** Based on the previous removal action (EE-12), site-specific conditions, and RMR criteria, no further remedial action recommended for hexavalent chromium.
	DM 7453	**FS:** DM 7453 (surface sample PA33SS11) identified as requiring action for lead. **EE Removal Action:** EE-12, a triangular area approximately 34 by 25 by 28 feet, was excavated to a depth of 10 feet bgs. **RMR:** Based on the previous removal action (EE-12), site-specific conditions, and RMR criteria, no further remedial action recommended for lead.
	DM 7560	**FS:** DM 7560 (boring IR33B087) identified as requiring action for hexavalent chromium. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for hexavalent chromium.
	DM 7657	**FS:** DM 7657 (boring IR33B062) identified as requiring further action for arsenic and beryllium. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic or beryllium.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-33 (cont.)	RA 33S-1	**FS:** RA 33S-1(borings IR33B092 and IR33B094) identified as requiring action for arsenic, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, PAHs, and PCBs.
	RA 33S-2	**FS:** RA 33S-2 (boring PA33B053) identified as requiring action for arsenic, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, PAHs, and PCBs.
	RA 33S-3	**FS:** RA 33S-3 (boring IR33B096) identified as requiring action for PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
	DM 8169	**FS:** DM 8169 (surface sample PA33SS57) identified as requiring action for hexavalent chromium. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for hexavalent chromium.
IR-34	DM 8258	**FS:** DM 8258 (boring IR34B023) identified as requiring action for PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs.
IR-35	RA 35-1	**FS:** RA 35-1 (surface samples IR35SS14, IR35SS15, and IR35SS16) identified as requiring action for PAHs and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PAHs and PCBs.
	DM 9363	**FS:** DM 9363 (surface sample PA35SS06) identified as requiring action for PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PCBs.
IR-37	RA 37-1	**FS:** RA 37-1 (borings IR37B014, IR37B015, and IR37B017 and surface sample PA37SS09) identified as requiring action for PAHs and PCBs. **EE Removal Action:** EE-14, an area approximately 26 by 13 feet, was excavated to a depth of 3 feet bgs. **RMR:** Based on the previous removal action (EE-14), no further remedial action recommended for PAHs; however, further investigation required for manganese. **TCRA SAP:** Determined further investigation was required for manganese and PCBs. Delineation sampling concluded no further remedial action recommended for manganese; however, further action was required for PCBs. **TCRA CR 1:** Excavated 25 cubic yards of soil; maximum depth of 4 feet bgs.
	RA 37-2	**FS:** RA 37-2 (borings IR37B010 and IR37B013) identified as requiring action for arsenic, beryllium, nickel, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no action recommended for arsenic, beryllium, PAHs, and PCBs; however, further action required for antimony. **TCRA SAP:** Determined further investigation required for antimony. Delineation sampling concluded further remedial action recommended for antimony. **TCRA CR 1:** Excavated 44 cubic yards of soil; maximum depth of 8 feet bgs.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-37 (cont.)	DM 6671	**RMR:** DM 6671 identified in RMR as the area surrounding surface sample IR37SS08 requiring further investigation for manganese. **TCRA SAP:** Determined further investigation required for manganese. Delineation sampling concluded no remedial action recommended for manganese. **TCRA CR 1:** Analysis of TCRA samples indicated that concentrations of manganese are due to the presence of chert or chert fragments. No excavation recommended.
	DM 6771	**RMR:** DM 6771 identified in the RMR as the area surrounding boring IR37B021 requiring further investigation for manganese. **TCRA SAP:** Determined further investigation required for manganese. Delineation sampling concluded no remedial action recommended for manganese. **TCRA CR 1:** Analysis of TCRA samples did not detect manganese at concentrations above TCRA cleanup goals. No excavation recommended.
IR-44	NA	**FS:** Identified no areas requiring action.
IR-45	NA	**FS:** Areas requiring action are identified for the IR site in which the steam lines are physically located with petroleum hydrocarbon compounds, including PAHs, as chemicals of concern. **TCRA:** Removed and disposed of 2,100 feet of petroleum-contaminated steam line and closed 14,500 feet of steam line in place.
IR-48	NA	**FS:** Identified no areas requiring action.
IR-50	NA	**FS:** Areas requiring action are identified for the IR site in which the storm and sanitary sewer lines are physically located. **Removal Action:** Cleaned out and disposed of 1,200 tons of sediments removed from the storm drain system.
IR-51	NA	**FS:** Areas requiring action are identified for the IR site in which the former transformer sites are physically located. **Cleanup Action:** 1988 action removed 12 transformers from Parcel D. In addition, 48 transformers stored in the yard adjacent to Buildings 524 were removed and disposed of off site.
IR-53	RA 53-1	**FS:** RA 53-1 (borings IR53B019 through IR53B026 and surface samples PA53SS09 and PA53SS10) identified as requiring action for arsenic, lead, and PCBs. **EE Removal Action:** EE-15/16, an irregular-shaped area approximately 990 square feet, was excavated to a depth of 2 feet bgs. **RMR:** Based on previous removal actions (EE-15/16), site-specific conditions, and current RMR criteria, no further remedial action recommended for arsenic, lead, and PCBs.
	RA 53-2	**FS:** RA 53-2 (borings IR53B013 through IR53B017 and surface samples PA53SS03, PA53SS04, and PA53SS12) identified as requiring action for arsenic, beryllium, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, beryllium, PAHs, and PCBs.
	RA 53-3	**FS:** RA 53-3 (borings IR53B018 and IR53B018A) identified as requiring action for arsenic, beryllium, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, beryllium, and PCBs. However, a new DM area (DM 11260) surrounding boring IR53B018A determined to require further investigation for PAHs.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-53 (cont.)	DM 11260	**RMR:** Identified as the area surrounding boring IR53B018A requiring further investigation for PAHs. **TCRA SAP:** Determined further investigation required for PAHs. Delineation sampling confirmed that further action required for PAHs. **TCRA CR 1:** Excavated 6 cubic yards of soil; maximum depth of 3 feet bgs.
IR-55	RA 55-1	**FS:** RA 55-1 (borings IR55B019, IR55B020, IR55B021, and IR55MW02A, and test pit sample PA55TA04) identified as requiring action for arsenic, lead, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, PAHs, and PCBs; however, a new DM area (DM 10676) surrounding boring IR55B016 determined to require further investigation for lead.
	DM 10383	**FS:** DM 10383 (test pit PA55TA10) identified as requiring action for arsenic and PAHs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic and PAHs.
	DM 10676	**RMR:** Identified as the area surrounding boring IR55B016 requiring further investigation for lead. **TCRA SAP:** Determined further investigation required for lead. Delineation sampling confirmed further action required for lead. **TCRA CR 1:** Excavated 7 cubic yards of soil; maximum depth of 3 feet bgs.
IR-65	DM 8866	**FS:** DM 8866 (borings IR65B001 and IR65B004) identified as requiring further action for arsenic and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for PCBs; however, further investigation required for arsenic. **TCRA SAP:** Determined further investigation required for arsenic. Delineation sampling confirmed action required for arsenic. **TCRA CR 1:** Excavated 12 cubic yards of soil; maximum depth of 3 feet bgs.
IR-66	NA	**FS:** Identified no areas requiring action.
IR-67	NA	**FS:** Identified no areas requiring action.
IR-68	RA 68-1	**FS:** RA 68-1 (borings IR68B001 through IR68B009) identified as requiring action for arsenic, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, PAHs, and PCBs.
IR-69	RA 69-1	**FS:** RA 69-1 (borings IR69B001 through IR69B006) identified as requiring action for arsenic, lead, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no further remedial action recommended for arsenic, lead, and PCBs.
IR-70	RA 70-1	**FS:** RA 70-1 (borings IR70B005 and IR70MW04A; surface samples IR70SS01, IR70SS02, and IR70SS03; and test pit sample PA45TA11) identified as requiring action for arsenic, hexavalent chromium, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, hexavalent chromium, PAHs, and PCBs.

TABLE 2-4: HISTORY OF IDENTIFYING AND EVALUATING FURTHER ACTIONS AT SOIL SITES IN PARCEL D (CONTINUED)

Revised Feasibility Study Report for Parcel D, Hunters Point Shipyard, San Francisco, California

IR Site	Remediation or De Minimis Area	Identifying Action
IR-70 (cont.)	RA 70-2	**FS:** RA 70-2 (borings IR55B022 through IR55B025, PA55B013, and IR70MW07A, and surface sample PA55SS16) identified as requiring action for arsenic, PAHs, and PCBs. **EE Removal Action:** EE-17, an irregular-shaped area approximately 420 square feet, was excavated to a depth of 7 feet bgs (approximately 110 cubic yards). **RMR:** Based on the previous removal action (EE-17), site-specific conditions, and RMR criteria, no further remedial action recommended for arsenic, PAHs, and PCBs.
	RA 70-3	**FS:** RA70-3 (boring IR70B009) identified as requiring action for arsenic, PAHs, and PCBs. **RMR:** Based on site-specific conditions and RMR criteria, no remedial action recommended for arsenic, PAHs, and PCBs.
IR-71	NA	**FS:** Identified no areas requiring action.

Notes: The Navy's recommendations from the RMR are described in this table.

bgs	Below ground surface
DM	*De minimis*
EE	Exploratory excavation
FS	Draft Final Parcel D Feasibility Study Report, January 24, 1997
HPAL	Hunters Point ambient level
IR	Installation Restoration
NA	Not applicable
PA	Preliminary assessment
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RA	Remediation area
RMR	Parcel D Risk Management Review Process Draft Final Report, June 20, 2000
TCRA	Time-critical removal action
TCRA CR 1	Parcel D Time-Critical Removal Action Closeout Report, September 28, 2001
TCRA CR 2	Parcel D Time-Critical Removal Action Closeout Report, May 13, 2005
TCRA SAP	Final Sampling and Analysis Plan Parcel D Soil Site Delineation, November 9, 2000

References:

Barajas and Associates, Inc. 2007. "Draft Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard" July 27.

Tetra Tech EM Inc. (Tetra Tech). 1997a. "Draft Final Parcel D Feasibility Study (FS), Hunters Point Shipyard, San Francisco, California." January 24.

Tetra Tech. 2000a. "Parcel D Risk Management Review Process, Draft Final Report, Hunters Point Shipyard, San Francisco, California." June 20.

Tetra Tech. 2000b. "Final Sampling and Analysis Plan Parcel D Soil Site Delineation, Hunters Point Shipyard, San Francisco, California." November 9.

Tetra Tech. 2004. "Final Work Plan, Time-Critical Removal Action for Parcel D Excavation Sites, Hunters Point Shipyard, San Francisco, California." November 1.

Tetra Tech and ITSI. 2005. "Final Closeout Report, Time Critical Removal Action for Parcel D Excavation Sites, Hunters Point Shipyard, San Francisco, California." May 13.

Tetra Tech and IT Corp. 2001. "Final Parcel D, Time-Critical Removal Action Closeout Report, Hunters Point Shipyard, San Francisco, California." December 6.

3.0 RISK EVALUATION SUMMARY AND REMEDIATION GOALS

This section summarizes the potential human health and environmental risks from exposure to chemicals present in soil and groundwater at Parcel D, identifies COCs for human health and environmental endpoints, and presents remediation goals for the identified COCs. The nature and extent of contamination of soil and groundwater at Parcel D is presented in Section 2.0.

3.1 HUMAN HEALTH RISK ASSESSMENT

A revised baseline HHRA was conducted for Parcel D. The objectives of the revised HHRA were to:

- Estimate the potential human health risks associated with potential future land use scenarios
- Identify the environmental media and contaminants that pose the primary health concerns
- Identify the environmental media and contaminants that are likely to pose little or no threat to human health
- Provide a foundation for assessing the need for further response actions

The original HHRA for Parcel D was conducted in 1996 as part of the RI for Parcel D (PRC, LFR, and U&A 1996). Since the RI was completed, additional data were collected at Parcel D during the TCRA in 2000 and 2001(Tetra Tech and IT Corp. 2001). Tetra Tech revised the original HHRA in 2002 as part of the draft revised FS to supplement the original HHRA with the soil data collected during the 2000 and 2001 TCRA. An additional TCRA in 2004 resulted in additional soil excavation and soil data collection (Tetra Tech and ITSI 2005). The HHRA presented in this FS report revises the HHRA presented in the 2002 draft revised FS report to account for the soil data collected during the 2004 TCRA and to incorporate changes in regulatory guidance and toxicological criteria that have occurred since the original HHRA was prepared in 1996. Soil data associated with sampling locations excavated and removed from HPS during the 2000, 2001, and 2004 TCRAs, as well as non-TCRAs for HPS, are excluded from this HHRA. Data for soil associated with sampling locations that have not been removed, including unremoved confirmation samples collected after removal actions, are included in the HHRA. In addition, groundwater data collected since the 2002 HHRA through quarter 18 (June 2004) as part of the basewide groundwater monitoring program for HPS are included in this HHRA. Lastly, the HHRA was revised based on HPS BCT agreements during 2003 and 2004.

The HHRA calculated cancer risks and noncancer hazards from exposure to chemicals of potential concern (COPC) in all affected environmental media for each pathway identified as potentially complete. Appendix B details the HHRA methodology and results for evaluating the COPC and assessing the COCs. This section provides an overview of the exposure scenarios and pathways evaluated in the HHRA and summarizes the results. In addition, remediation goals are presented for the COCs for Parcel D, as identified from the results of the HHRA.

samples and appropriate personal protective equipment during sampling efforts. Remediation would be performed under a health and safety program to prevent worker injuries.

Environmental impacts in the areas where the injection treatment would be applied are minor due to the industrial use of the areas. Similarly, the short-term increase in traffic during active treatment and monitoring would have minimal environmental impact. No adverse environmental impacts would result from construction and implementation of the groundwater monitoring for metals because no groundwater treatment is proposed for metals in this alternative.

Active treatment under Alternatives GW-3A and GW-3B would likely be implemented in less than 1 year. The reduced groundwater monitoring for VOC plumes is anticipated to be complete within 5 years; however, the monitoring duration must demonstrate the effectiveness of the treatment, and the permanent reduction of the VOCs in the groundwater. Groundwater monitoring for metals is anticipated to be complete within 5 years.

The overall rating for Alternatives GW-3A and GW-3B for the short-term effectiveness is very good.

6.3.3.6 Implementability: Alternatives GW-3A and GW-3B

Implementability includes technical and administrative feasibility and the availability of required resources. Two pilot studies at HPS demonstrated that injection treatment is feasible at HPS (Shaw Environmental, Inc. 2005; Tetra Tech 2003b). Treatment requires a moderate level of resources for a short duration. The major difficulty with implementing injection technologies during pilot studies at HPS has been mass transfer of the treatment substrate to the contaminants. Data from pilot studies as well as the lithology of the treatment area will be used to determine sufficient injection points for treatment additives to optimize their success. Groundwater monitoring is a routine activity and requires a moderate level of resources. The overall rating for Alternatives GW-3A and GW-3B for implementability is very good.

6.3.3.7 Cost: Alternatives GW-3A and GW-3B

The total capital and O&M costs for Alternatives GW-3A and GW-3B are presented in Table 6-1 and detailed in Appendix F. The costs to implement the institutional controls are low, and the cost to implement the monitoring program is moderate. The costs for *in situ* treatment are moderate for Alternative 3A and very high for Alternative 3B. The cost to implement the monitoring of groundwater for metals is moderate.

The costs for implementing the *in situ* treatments for Alternatives GW-3A and GW-3B were derived from the HPS ZVI pilot study (Alternative GW-3B) and vendor information for substrates for biodegradation of VOCs (Alternative GW-3A) (see Appendix F). These volume assumptions were based on the volume of treatment additive per foot thickness of aquifer to be treated from the vendor's estimation, compared to the volume of ZVI per foot of thickness of aquifer that was treated during the ZVI pilot study treatment at HPS. The spacing for the

The overall rating for Alternatives GW-4A and GW-4B for the short-term effectiveness is very good.

6.3.4.6 Implementability: Alternatives GW-4A and GW-4B

Implementability includes technical and administrative feasibility and the availability of required resources. Two pilot studies at HPS demonstrated that injection treatment is feasible at HPS (Shaw Environmental, Inc. 2005; Tetra Tech 2003b). Treatment requires a moderate level of resources for a short duration. The major difficulty with implementing injection technologies during pilot studies at HPS has been mass transfer of the treatment substrate to the contaminants. Data from pilot studies as well as the lithology of the treatment area will be used to determine sufficient injection points for treatment additives to optimize their success.

Groundwater monitoring is a routine activity and requires a moderate level of resources, but would be less than the resources needed for Alternative GW-2 due to the shorter duration of the required monitoring.

The overall rating for Alternatives GW-4A and GW-4B for implementability is very good.

6.3.4.7 Cost: Alternatives GW-4A and GW-4B

The total capital and O&M costs for Alternatives GW-4A and GW-4B are presented in Table 6-1 and detailed in Appendix F. The costs to implement the institutional controls are low, and the cost to implement the monitoring program is moderate. The costs for *in situ* treatment are moderately high for Alternative GW-4A and very high for Alternative GW-4B.

The costs for implementing the *in situ* treatments for Alternatives GW-4A and GW-4B were derived from the HPS ZVI pilot study (Alternative GW-4B) and vendor information for metals treatment compound and substrates for biodegradation of VOCs (Alternative GW-4A) (see Appendix F). These volume assumptions were based on the volume of treatment additive per foot thickness of aquifer to be treated from the vendor's estimation, compared to the volume of ZVI per foot of thickness of aquifer that was treated during the ZVI pilot study treatment at HPS. The spacing for the treatment injection points proposed by the remediation product vendor was approximately the same as the treatment spacing used for the ZVI pilot study. Based on these assumptions, the difference in costs of Alternative GW-4A to apply the metals or VOC treatment compounds, compared to the costs of Alternative GW-4B to apply the ZVI additive, is the difference in the cost of the additives. It was found that the cost of the ZVI additive per pound is one-third the cost of the bioremediation substrate additive. However, the treatment for the same volume of contaminated groundwater requires approximately 25 times the volume of ZVI; therefore, the total capital cost of the ZVI additives will be 8 to 10 times the cost of the total capital cost of the bioremediation substrate.

The overall rating for Alternative GW-4A for cost of implementing is good, and the overall rating for Alternative GW-4B for cost of implementing is poor.

PRC and Levine-Fricke-Recon, Inc. 1997. "Parcel D Feasibility Study, Draft Final Report, Hunters Point Shipyard, San Francisco, California." January 24.

PRC, Levine-Fricke-Recon, Inc., and Uribe & Associates. 1996. "Parcel D Remedial Investigation, Draft Final Report, Hunters Point Shipyard, San Francisco, California." October 25.

Radiological Affairs Support Office. 2004. "Hunters Point Shipyard, Historical Radiological Assessment, History of the Use of General Radioactive Materials, 1939 – 2003." August.

San Francisco Bay Regional Water Quality Control Board (Water Board). 1998. Site Cleanup Requirements Order No. 98-072 for Catellus Development Corporation and SF Pacific Property, Inc. July 15, 1998.

Water Board. 2003. Letter Concurring that A-aquifer Groundwater Beneath HPS is not a Source of Drinking Water. To Mr. Keith Forman, Base Realignment and Closure Environmental Coordinator. From Mr. Curtis Scott, Water Board. September 25.

San Francisco Redevelopment Agency. 1997. "Hunters Point Shipyard Redevelopment Plan." July 14.

Shaw Environmental, Inc. 2005. "*In Situ* Sequential Anaerobic Bioremediation Treatability Study, Remedial Unit C5, Building 134 Installation Restoration Site 25, Hunters Point Shipyard, San Francisco, California." August 24.

Tetra Tech EC, Inc. 2007. Revised Basewide Storm Drain and Sanitary Sewer Removal Action Work Plan, Hunters Point Shipyard, San Francisco, California. July 17.

Tetra Tech EM Inc. (Tetra Tech). 1997a. "Draft Final Parcel D Feasibility Study (FS), Hunters Point Shipyard, San Francisco, California." January 24.

Tetra Tech. 1997b. "Final Parcel D RI Report, Hunters Point Shipyard, San Francisco, California." January 31.

Tetra Tech. 1997c. "Proposed Plan, Parcel D, Hunters Point Shipyard, San Francisco, California." May 11.

Tetra Tech. 1997d. "Final Parcel D FS, Hunters Point Shipyard, San Francisco, California." August 29.

Tetra Tech. 1997e. "Draft Parcel D Record of Decision, Hunters Point Shipyard, San Francisco, California." November 3.

Tetra Tech. 1998. "Hunters Point Shipyard Basewide Environmental Baseline Survey." September 4.

Tetra Tech. 1999. "Draft Final Technical Memorandum, Parcel D A-Aquifer Groundwater Beneficial Use Evaluation, Hunters Point Shipyard, San Francisco, California." November 24.

Tetra Tech. 2000a. "Parcel D Risk Management Review Process, Draft Final Report, Hunters Point Shipyard, San Francisco, California." June 20.

Tetra Tech. 2000b. "Final Sampling and Analysis Plan Parcel D Soil Site Delineation, Hunters Point Shipyard, San Francisco, California." November 9.

Tetra Tech. 2001a. "Revised Information Package for the Phase I Groundwater Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." Revision 01. January 8.

Tetra Tech. 2001b. "Revised Parcel D Information Package for the Phase II Groundwater Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." March 8.

Tetra Tech. 2001c. "Final Groundwater Beneficial Use for A-Aquifer Parcels C, D, and E, Hunters Point Shipyard, San Francisco, California." April 12.

Tetra Tech. 2003a. "Parcel D Information Package for Installation Restoration Site 22, Phase III Groundwater Data Gaps Investigation (Revision 01), Hunters Point Shipyard, San Francisco, California." May 9.

Tetra Tech. 2003b. "Cost and Performance Report FEROX^{sm} Injection Technology Demonstration, Parcel C, Remedial Unit C4, Hunters Point Shipyard, San Francisco, California" July 11.

Tetra Tech. 2004. "Final Work Plan, Time-Critical Removal Action for Parcel D Excavation Sites, Hunters Point Shipyard, San Francisco, California." November 1.

Tetra Tech and Innovative Technical Solutions, Inc. (ITSI) 2004. "Draft Metals Concentrations in Franciscan Bedrock Outcrops: Three Sites in the Hunters Point Shear Zone and Marin Headlands Terrane Subunits, Hunters Point Shipyard, San Francisco, California". March 17.

Tetra Tech and ITSI. 2005. "Final Closeout Report, Time Critical Removal Action for Parcel D Excavation Sites, Hunters Point Shipyard, San Francisco, California." May 13.

Tetra Tech and IT Corp. 2001. "Final Parcel D, Time-Critical Removal Action Closeout Report, Hunters Point Shipyard, San Francisco, California." December 6.

TPA-CKY 2005. "Draft Final Site Close Out Report Total Petroleum Hydrocarbon Program Corrective Action Implementation Plan Soil Removal for Parcels B, C, D, and E, Hunters Point Shipyard, San Francisco, California." June.

U.S. Department of the Navy (Navy). 1996. "Final Action Memorandum, Removal Action Documentation for Exploratory Excavation Sites, Hunters Point Shipyard, San Francisco, California." July 24.

Department of the Navy. 2001. "Basewide Radiological Removal Action, Action Memorandum, Hunters Point Shipyard, San Francisco, California." Final. November 19.